texture property values in a first predetermined range and the shape property values in a second predetermined range are then removed. The final output **1010** illustrates verified locations corresponding to valid monetary banknotes within the scanned image **1001**. The above detailed present invention therefore provides a verification method for determining areas within an image corresponding to monetary banknotes. Characteristics of the scanned image are compared with that of known values and/or ranges of valid monetary banknotes for verifying banknote locations within the image.

[0151] The method can be applied for use in the detection of counterfeit currency. The scanned image can contain the sample monetary banknote while superimposed onto any arbitrary background, contain multiple isolated or independent banknotes, have overlapping banknotes, or have arbitrary rotational and shift alignments.

[0152] Use of the present invention method not only provides an increased means of security measures when used in application for counterfeit banknote detection, it also provides ease of integration with common hardware devices and a viable low cost approach. Accurate detection rates, with low false detection frequencies can therefore be attained. The method is also robust and flexible enough to be applied to different image types and conditions.

[0153] Those skilled in the art will readily observe that numerous modifications and alterations of the device and method may be made while retaining the teachings of the invention. Accordingly, the above disclosure should be construed as limited only by the metes and bounds of the appended claims.

What is claimed is:

1. A verification method for determining areas within an image corresponding to monetary banknotes, the method comprising:

dividing the image into a plurality of verification sections;

generating a banknote boundary map having border sections corresponding to a boundary of valid monetary banknotes within the image;

generating a texture decision map from the image having texture sections, the texture sections each having texture values within a valid range according to a valid monetary banknote, wherein generating the texture decision map includes:

dividing the image into a plurality of feature sections;

generating a texture feature map having texture values for each feature section;

including the border sections within the texture sections;

selecting feature sections having texture values within a first texture value threshold range as potential texture sections;

determining an average texture value for surrounding feature sections of each potential texture section; and

further including potential texture sections having surrounding feature sections with the average texture value within a second texture value threshold range within the texture sections;

determining a number of objects in the texture decision map by removing texture sections in the texture decision map that correspond to the border sections in the banknote boundary map;

calculating a texture property value for each object according to a texture feature map having a texture feature value for each verification section;

calculating a shape property value for each object; and

further removing texture sections from the texture decision map corresponding to objects that do not have the texture property value within a first predetermined range and the shape property value within a second predetermined range.

2. The method of claim **1** wherein generating the banknote boundary map comprises:

dividing the image into a plurality of image sections;

generating a color feature map containing color histogram data for each image section;

generating a gray level feature map indicating a gray level value for each image section;

recording border sections onto the banknote boundary map as the image sections having color histogram data within a predetermined color range and gray level values within a predetermined gray level range;

removing internal border sections enclosed by perimeter border sections from the banknote boundary map; and

selecting the perimeter border sections as the border sections on the banknote boundary map.

3. The method of claim **2** wherein the color histogram data for each image section comprises a width of a color histogram for a first color, a median value of the color histogram for the first color, a width of a color histogram for a second color, a median value of the color histogram for the second color, a width of a color histogram for a third color, and a median value of the color histogram for the third color.

4. The method of claim **3** wherein the color histogram data is red green blue (RGB) color histogram data.

5. The method of claim **2** wherein the predetermined color range is determined according to color histogram data for a boundary of a valid monetary banknote.

6. The method of claim **2** wherein the predetermined gray level range is determined according to gray levels for a boundary of a valid monetary banknote.

7. The method of claim **2** wherein removing internal border sections enclosed by perimeter border sections from the banknote boundary map further comprises removing a number of border sections greater than a threshold number.

8. The method of claim **2** wherein removing internal border sections enclosed by perimeter border sections from the banknote boundary map further comprises removing a number of internal border sections

corresponding to a predetermined surface area.

9. The method of claim **2** further comprising generating a color binary decision map indicating probable sections corresponding to the monetary banknotes; and recording the border sections onto the banknote boundary map as the probable sections having color histogram data within the predetermined color range and gray levels within the predetermined gray level range.

10. The method of claim **9** wherein the probable sections of the color binary decision map are determined according to a frequency of occurrence of the color histogram data within the valid monetary banknote.

11. The method of claim **9** wherein generating the color binary decision map further comprises:

dividing the image into a plurality of decision sections

extracting color histogram data for each decision section;

assigning a color vector for each decision section according to the color histogram data of the decision section;